

## **WHAT IS CLAIMED IS:**

1. A method of radio transmitting high order synchronous digital signals, said method comprising the steps of:

- receiving the digital signals in the form of standard frames comprising header bytes, the header bytes in turn comprising Regenerator Section OverHead bytes and Multiplex Section OverHead bytes;
- subdividing each of the received standard frames into a number of sub-frames; and
- transmitting said sub-frames towards a corresponding receiver apparatus,

wherein the method comprises the additional steps of:

- terminating the Regenerator Section OverHead bytes of the received standard frames and performing a computation of the parity byte;
- providing a Radio Frame Complementary OverHead;
- transmitting the terminated Regenerator Section OverHead bytes and the Radio Frame Complementary OverHead interleaved by columns in a 1+1 protected configuration; and wherein
- said step of subdividing the received standard frame into a number of sub-frames comprises the step of subdividing by columns the standard frame into two sub-frames for transmitting them over working channels by using only two RF carriers without performing any multiplexing/demultiplexing operation.

2. A method according to claim 1, wherein the step of transmitting the two sub-frames by using only two RF carriers comprises the step of using an additional carrier of a protection radio channel.

3. A method according to claim 1, wherein the step of subdividing the standard frames is synchronized by means of a sync signal present in the standard frames themselves so that the sub-frames will be synchronized with the standard frames.

4. A method according to claim 1, wherein the step of subdividing the standard frames into two sub-frames comprises the step of inserting in an alignment word two different headers coloring the degree of decomposition thereof so as to identify, in a subsequent standard frame recomposition step, the correct sequence of the two received sub-frames.

5. A method according to claim 2, wherein it comprises the further step of performing a multichannel switching for operating a hitless protection on the sub-frames.

6. A method of receiving high order synchronous digital signals which have been transmitted via radio, said method comprising the steps of:

- said step of combining sub-frames comprises the step of recomposing by columns the received sub-frames through a mapping process based on the recognition of the respective alignment words and of the header to identify the correct sequence of the two received sub-frames; and wherein it further comprises the steps of
  - extracting Regenerator Section OverHead bytes from a Radio Frame Complementary OverHead; and
  - inserting said Regenerator Section OverHead bytes in the respective positions after the step of recomposing by columns.

7. A method according to claim 6, wherein the step of receiving sub-frames comprises the step of receiving said sub-frames transmitted over working channels by using only two RF carriers without performing any multiplexing/demultiplexing operation and possibly over a protection channel with an additional carrier.

8. A method according to claim 6, wherein the step of recomposing by columns the received sub-frames is synchronized by means of one of sync signals present in the sub-frames so that the obtained standard frames are synchronized with the sub-frames.

9. A method according to claim 6, wherein the step of recomposing by columns the received sub-frames comprises the step of aligning the received sub-frames by using a pair of elastic memories and a phase-locked loop connected to the synchronization step.

10. A method according to claim 9, wherein the step of aligning the sub-frames comprises the step of using an alignment algorithm substantially corresponding to the one used for the standard frames.

11. An apparatus for radio transmitting high order digital signals, said apparatus comprising:

- means for receiving the digital signals in the form of standard frames, the standard frames comprising header bytes, the header bytes comprising Regenerator Section OverHead bytes and Multiplex Section OverHead bytes;
  - means for subdividing each of the received standard frames into a number of sub-frames; and
  - means for transmitting said sub-frames towards a corresponding receiver,
- and wherein it further comprises:

- means for terminating the header bytes of the received frames and performing computation of a parity byte;
- means for sending the terminated RSOH bytes to a frame complementary section for the transmission thereof in a 1+1 protection scheme, interleaved by columns with the sub-frames, over two working channels or over a working channel and a protection channel; wherein
- said means for subdividing the received standard frame into a number of sub-frames comprise means designed to subdivide by columns the standard frame into two sub-frames for transmitting them over working channels by using only two RF carriers without performing any multiplexing/demultiplexing operation.

12. An apparatus according to claim 11, wherein it further comprises a multichannel switch able to perform a bridging of the two sub-frames to be transmitted over a possible protection radio channel.

13. An apparatus according to claim 11, wherein it further comprises clock recovery means restoring the sync signal directly from the received standard sub-frames.

14. An apparatus for receiving high order synchronous digital signals transmitted via radio, said apparatus comprising:

- means for receiving sub-frames transmitted through a corresponding transmitter apparatus; and

- means for combining the received sub-frames to obtain signal standard frames; wherein

- said means for combining the sub-frames interleave by columns the received sub-frames through a mapping process based on the recognition of the respective alignment words and of the header to identify the correct sequence of the two received sub-frames; and wherein it further comprises

- means for extracting the RSOH bytes from a Radio Frame Complementary OverHead section; and

- means for inserting said RSOH bytes in the respective positions after the step of recomposition-by-columns.

15. An apparatus according to claim 14, wherein it further comprises a multichannel switch able to perform a hitless protection on the two received sub-frames, by using a possible protection radio channel.

16. An apparatus according to claim 14, wherein it comprises selective clock recovery means for restoring the sync signal from one or the other sub-frame.